

1 Question

If $y = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right)$, find $\frac{dy}{dx}$

Answer

$$\begin{array}{l|l} y = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \quad \boxed{\text{Put } x = \tan \theta} & = 2\theta \\ & = 2 \tan^{-1} x \\ & \therefore \frac{dy}{dx} = \frac{2}{1+x^2} \\ & = \cos^{-1}(\cos 2\theta) \end{array}$$

2 Question

If $y = \tan^{-1} \left(\frac{1+x \sin x}{x - \sin x} \right)$, find $\frac{dy}{dx}$

Answer

$$\begin{array}{l|l} y = \tan^{-1} \left(\frac{1+x \sin x}{x - \sin x} \right) & = \cot^{-1} x + \tan^{-1}(\sin x) \\ & \therefore \frac{dy}{dx} = \frac{-1}{1+x^2} + \frac{1}{1+\sin^2 x} \frac{d}{dx}(\sin x) \\ & = \frac{-1}{1+x^2} + \frac{\cos x}{1+\sin^2 x} \\ & = \tan^{-1} \frac{1}{x} + \tan^{-1}(\sin x) \end{array}$$